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(54)

Method and system for data block sparing in a solid-state storage device

(57) A method and system for enhancing the reliability of a solid-state storage device based on electronic memory. The electronic memory is organized into low-address and high-address spare table regions (201, 205), low-address and high-address spare page regions (202, 204), and a large data page region (203). Data blocks (310) within the memory are specified by accessing devices using a logical data block address (302), including a page index (304) and a data block index (303). The page index selects a particular spare table (301), a particular spare page (307), and a particular data page (309). The data block index selects a spare table element (306) within the spare table (301), and a data block (310) within a data page (309). When an LDBA (302) has been remapped, information in a corresponding spare table element (306) is used to locate a physical block (308) within a spare page (307).

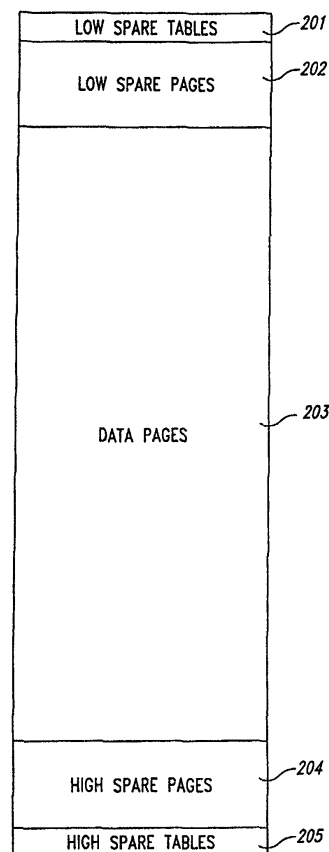


Fig. 2



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EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 907 856 A (GANJUEI ALI R ET AL) 25 May 1999 (1999-05-25) * column 9, last paragraph - column 11, paragraph 3; figures 11-22 *	1-3,7,8	G06F12/02 G06F3/06 G06F12/10
X	US 6 000 006 A (BRUCE RICARDO H ET AL) 7 December 1999 (1999-12-07) * column 5, line 39 - column 12, line 10; figures 3-5,8,9 *	1,2,7	
X	US 6 149 316 A (HARARI ELIYAHOU ET AL) 21 November 2000 (2000-11-21) * column 7, line 20 - column 12, line 18; figure 5 *	1,2,7	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			G06F
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 9 July 2002	Examiner Beker, H
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03 82 (p04C01)



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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1-3, 7-8



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LACK OF UNITY OF INVENTION
SHEET B

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-3,7-8

A solid state storage device with spare tables pointing to spare pages to which logical addresses are remapped if a remap indication indicates that a page has been remapped

2. Claims: 4-5

A solid state storage device with multiple spare table regions wherein a secondary spare table region contains a redundant copy of a spare table region in a primary spare table region.

3. Claim : 6

A solid state storage device, with spare tables containing as many elements as blocks as a data page contains data blocks in which the first block contains a spare block map

4. Claims: 9-10

A method of transforming a logical data block address in which a spare table is cached in a memory cache.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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